Supplemental Specification
2005 Standard Specification Book

SECTION 02765

PAVEMENT MARKING PAINT

Delete Section 02765 in its entirety and replace with the following:

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish Acrylic Water Based pavement marking paint. Refer to this Section, article 2.2 for resin requirement.

B. Apply to hot mix asphalt or Portland cement as edge lines, center lines, broken lines, guidelines, contrast lines, symbols, and other related markings.

C. Remove pavement markings.

1.2 REFERENCES

A. AASHTO M 247: Standard Specification for Glass Beads Used in Traffic Paints

B. ASTM D 562: Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer

C. ASTM D 2205: Standard Guide for Selection of Tests for Traffic Paints

D. ASTM D 2743: Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography

E. ASTM D 2805: Standard Test Method for Hiding Power of Paints by Reflectometry

F. ASTM D 3723: Standard Test Method for Pigment Content of Water-Emulsion Paints by Low-Temperature Ashing

G. ASTM D 3960: Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings

H. ASTM D 4451: Standard Test Method for Pigment Content of Paints by Low-Temperature Ashing

I. ASTM D 5381: Standard Guide for X-Ray Fluorescence (XRF) Spectroscopy of Pigments and Extenders

J. ASTM E 1347: Standard Test Method for Color and Color-Difference Measurement by Tristimulus (Filter) Colorimetry

K. Federal Standards

L. Manual on Uniform Traffic Control Devices (MUTCD)

M. UDOT Materials Manual of Instruction, Part 8

N. UDOT Minimum Sampling and Testing Requirements

1.3 ACCEPTANCE

A. Provide documentation of the manufacturer and production batch identification for the paint used.

B. Provide fixtures (ball valves, gate valves or other) on paint truck for the purposes of obtaining field samples.

C. Agitate the paint to allow for thorough mixing. Follow paint manufacturer's recommendation for agitation and mixing times.

D. Stop all agitation before sample is drawn.

E. Calibrate all meters on the paint truck annually and certify for application rate verification.
   1. Use the following calibration tolerances for meters:
      a. Paint: ± 0.1 gal
      b. Beads: ± 0.5 lb/gal
   2. Keep a clean, legible copy of calibration report with the paint truck.
   3. Provide a copy of certification at the Engineer's request.

F. The Engineer will:
   1. Visually inspect lines and legends (symbols and messages) to verify compliance with the required dimensions.
   2. Inspect at a minimum at the end of each production day.
   3. Verify quantities applied by either of the following methods:
      a. Measuring both paint and bead tanks prior to and after application.

b. Witnessing the meter readings prior to and after application.
   1) A printout of meter readings, in lieu of witnessing, may be accepted at the Engineer's discretion.

4. Sample in accordance with the UDOT Materials Manual of Instruction, Part 8-932 and the UDOT Minimum Sampling and Testing Requirements.

G. Repaint any line or legend failing to meet bead adherence and dimensional requirements.

H. Price Reductions. When more than one of the requirements of the pavement markings is deficient, the result with the highest price reduction governs.

1. Price reductions for pavement markings installed below the specified wet mil thickness are outlined in Table 1.

Table 1

Price Reduction for Wet Mil Thickness	
	Pay Factor
At the specified mil thickness	1.00
1-10 percent below the Specified wet mil thickness	0.75
11-15 percent below the Specified wet mil thickness	0.50
More than 15 percent below the Specified wet mil thickness	0.00 *

* Repaint pavement markings at no cost to UDOT.

2. Price reductions for pavement markings installed below the specified total solids, pigment, and non-volatile vehicle content (shown in table 4) are outlined in Table 2.

Table 2

Price Reduction for Total Solids, Pigment and Non-Volatile Vehicle	
	Pay Factor
At or above the specified percentage	1.00
Up to 0.5 percent below the specified percentage	0.85
0.5 to 1.0 percent below the specified percentage	0.70
More than1.0 percent below the specified percentage	0.00 *

* Repaint pavement markings at no cost to UDOT.

3. Price reductions for pavement markings that fail to meet the remaining requirements of Table 4 are outlined in Table 3.

Table 3

Price Reductions	
	Pay Factor
At the specified requirements	1.00
Up to1 percent deficient	0.90
1 to 2 percent deficient	0.80
2 to 3 percent deficient	0.70
3 to 4 percent deficient	0.60
4 to 5 percent deficient	0.50
More than 5 percent below specified quantitative requirements	0.00 *

* Repaint pavement markings at no cost to UDOT.

PART 2 PRODUCTS

2.1 PAINT

A. Meet the requirements for Acrylic Water Based Paint as listed in Table 4:

Table 4

Paint Requirements				
Property	White	Yellow	Black	Test
Pigment: Percent by weight	63.0	63.0	63.0	ASTM D 3723
Total Solids: Percent by weight, minimum	79.0	79.0	79.0	ASTM D 2205
Nonvolatile vehicle: Percent by weight vehicle, minimum*	43.0	43.0	43.0	ASTM D 2205
Viscosity, KU @ 77 degrees F	80 - 95	80 - 95	80 - 95	ASTM D 562
Density, lb/gal	14.1 ± 0.3	14.1 ± 0.3	14.1 ± 0.3	ASTM D 2205
Volatile Organic Content (VOC): lb/gal, maximum	1.25	1.25	1.25	ASTM D 3960
Titanium Dioxide Content, lb/gal	1.0 min	0.2 max	N/A	ASTM D 5381
Color Definition	37875	33538	N/A	Federal Standard 595B
Directional Reflectance: Minimum	90.0	50.0	N/A	ASTM E 1347
Dry Opacity: Minimum (5 mils wet)	0.95	0.95	N/A	ASTM D 2805

* Binder: 100 percent acrylic cross-linking polymer, by weight, as determined by infrared analysis and other chemical analysis available to UDOT (ASTM D 2205).

B. No-Pick-Up Time
1. Paint may not smear or track three minutes after application to the roadway using standard application equipment, at the mil thickness required, and with an ambient shaded temperature of at least 50 degrees F.

C. Additional requirements:
1. Free of lead, chromium, or other related heavy metals ASTM D 5381.
2. ASTM D 2743, ASTM D 4451 and ASTM D 5381: Tests used to verify paint samples meet Accepted Products Listing.

2.2 GLASS SPHERES (BEADS) USED IN PAVEMENT MARKING PAINT

A. Specific Properties: Meet AASHTO M 247 with the following exceptions.
   1. Gradation:

Passing a No. 14 sieve, percent	95 - 100
Passing a No. 16 sieve, percent	80 - 95
Passing a No. 18 sieve, percent	10 - 40
Passing a No. 20 sieve, percent	0 - 5
Passing a No. 25 sieve, percent	0 - 2

   2. Beads: Silane adhesion coating.
   3. Roundness - The glass beads will have a minimum of 80 percent true spheres.

B. Beads used in Temporary Pavement Markings meet the above or AASHTO M 247 Type II uniform gradation.

PART 3 EXECUTION

3.1 PREPARATION

A. Line Control.
   1. Establish control points at 100 ft intervals on tangent and at 50 ft intervals on curves.
   2. Maintain the line within 2 inches of the established control points and mark the roadway between control points as needed.
      a. Remove paint that is not placed within tolerance of the established control points and replace at no expense to the Department. Refer to this Section, article 3.4.
      b. Maintain the line dimension within 10 percent of the width and length dimensions defined in Standard Drawings.

B. Remove dirt, loose aggregate and other foreign material and follow manufacturer’s recommendations for surface preparation.

3.2 APPLICATION

A. Apply Pavement marking paint at the following wet mil thickness requirements.
   1. 20 – 25 wet mils for all longitudinal markings.

   Example Calculation: (Verify wet mil thickness)

   $$\text{Wet Mils} = \frac{(0.133681\ ft^3/gal) * 12000\ mil/ft}{(X\ ft/gal)(Z\ ft)}$$

   Where,
   X = application rate. (Meter readings or dipping tanks).
   Z = line width measured in feet.
   12000 = conversion from ft to mil
   0.133681 = conversion from gallons to cubic feet.

      For information only: Approximate application rate for required mil thickness requirements.
      a. 4 inch Solid Line: From 190 to 240 ft/gal
      b. 4 inch Broken Line: From 760 to 960 ft/gal
      c. 8 inch Solid Line: From 95 to 120 ft/gal

   2. 23 – 40 wet mils for all painted legends as determined by a wet mil gauge.

C. Refer to Table 1 for pavement markings that are less than required wet mils in thickness.

D. No additional payment for pavement markings placed in excess of required wet mils in thickness or exceeding dimensional requirements outlined in this Section, article 3.1 paragraph A.

E. Glass Sphere (Beads): Apply a minimum of 8 lb/gal of paint, the full length and width of line and pavement markings.
   1. Do not apply glass beads to contrast lines (black paint).

F. Begin striping operations no later than 24 hours after ordered by the Engineer.

G. At time of application apply lines and pavement markings only when the air and pavement temperature are:
   1. 50 degrees F and rising for Acrylic Water Based Paint.

H. Comply with TC Series Standard Drawings.

3.3 CONTRACTOR QUALITY CONTROL

A. Application Rate: Verify that the paint and beads are being applied within specified tolerances prior to striping.

B. Curing: Protect the markings until dry or cured. In the event that the uncured marking is damaged the marking will be reapplied and track marks left on the pavement will be removed at no additional cost to the Department.

3.4 REMOVE PAVEMENT MARKINGS

A. Use one of these removal methods:
   1. High pressure water spray,
   2. Sand blasting,
   3. Shot blasting,
   4. Grinding.

   Grinding is not allowed on the final surfacing unless the Engineer grants prior written approval.

B. Do not eliminate or obscure existing striping, in lieu of removal, by covering with black paint or any other covering.
   1. The Engineer may grant prior written approval for use of black paint or other obscuring material for work durations shorter than "long term stationary" as defined in the Temporary Traffic Control section of the MUTCD.

C. Use equipment specifically designed for removal of pavement marking material.

END OF SECTION